

Multiplexed, spatially encoded illumination system for determining imaging and range estimation

Abstract

A illumination device sequentially projects a selective set of spatially encoded intensity light pulses toward a scene. The spatially encoded patterns are generated by an array of diffractive optical or holographic elements on a substrate that is rapidly translated in the path of the light beam. Alternatively, addressable micro-mirror arrays or similar technology are used to manipulate the beam wavefront. Reflected light is collected onto an individual photosensor or a very small set of high performance photodetectors. A data processor collects a complete set of signals associated with the encoded pattern set. The sampled signals are combined by a data processing unit in a prescribed manner to calculate range estimates and imaging features for elements in the scene. The invention may also be used to generate three dimensional reconstructions.